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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/809,399 | 03/16/2001 | Howard B. Goldman | | 3582 |

7590 11/03/2003

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| EXAMINER | |
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| NGUYEN, THU V | |
| ART UNIT | PAPER NUMBER |
| 3661 | |

DATE MAILED: 11/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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| ART UNIT | PAPER |
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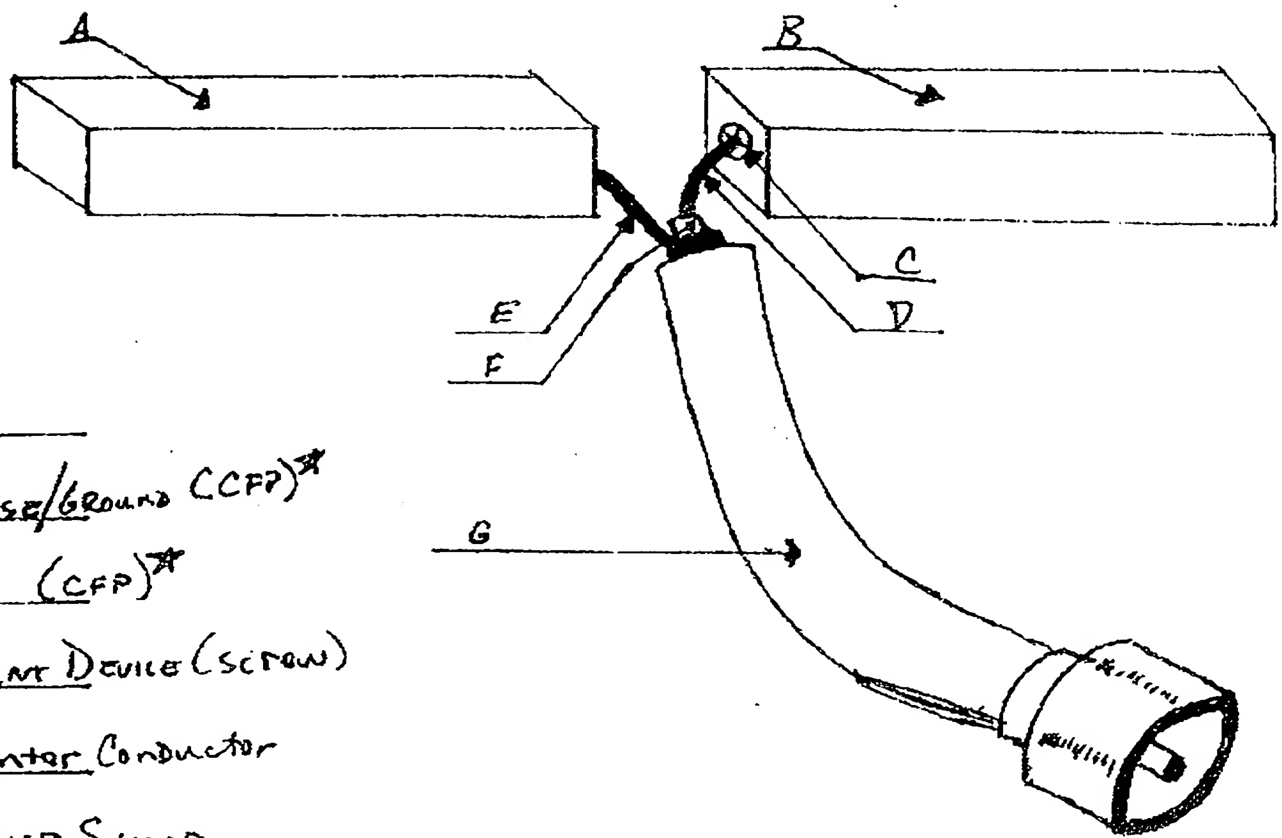
**Commissioner for Patents**

Enclosed herein the provisional application 60/269414 & 60/268822 you requested.

Nguyen

Thu Nguyen
Primary Examiner
Art Unit: 3661

FIG 1




A COUNTERPOISE/GROUND (CFP)*
B RADIATOR (CFP)*
C ATTACHMENT DEVICE (SCREW)
D COAX- CENTER CONDUCTOR
E COAX- OUTER SHIELD
F COAX- CENTER CONDUCTOR INSULATOR
G COAX

* CONDUCTOR-FILLED PLASTIC

PATENT DISCLOSURE: LOW-COST ANTENNAS USING CONDUCTIVE PLASTICS
INVENTORS : THOMAS AISENBREY, DANIEL HARRELL
ASSIGNEE : INTEGRAL TECHNOLOGIES INC

## SUMMARY OF INVENTION:

The essence of this invention is the use of conductive plastics such as LNP Engineering Plastics Inc. (Exton, PA) family of conductor-filled plastics to build antennas that include planar as well as conformal antennas, dipoles, and monopoles. In fact, virtually any antenna that is now built out of wire, strip-line or printed-circuit boards can be constructed out of the conductive plastics from LPN or equivalent materials at a relatively low cost. The plastic will work at any frequency and is tuned in exactly the same way as a wire antenna or printed wire antenna would be tuned. Examples of plastic antenna shapes include rectangular and circular planars as well as rod-like structures.

These plastic antennas can readily be cut or milled to shape or stamped out of molds, resulting in a more efficient and less costly antenna than can now be produced out of simple wire or from etching metal patterns on circuit boards. In addition, the shaped conductive plastic antenna can be designed to be an integral part of the frame of a display device, i.e., PDA, or the casing of a cell or portable phone.

## IN THE DRAWINGS:

Figure 1 illustrates a working dipole CFP antenna structure. As noted, segment A is the ground or 'counterpoise' or mirror structure of the active or radiator antenna. Attachment to a standard coax is illustrated. Note that this antenna could be in such a position on an insulated plane surface or it can be placed on a conducting surface, only requiring a very thin insulator between radiator B and the conducting surface. If surface is grounded, then segment A may be placed directly on surface, otherwise a very thin insulator layer needs to be placed between A and the conducting surface. The rectangular dimensions of A & B determine the optimum operating frequency of the antenna. The length is the main determinant, however, the cross-section dimension is also a factor, although not a strong factor.

Figure 2 and 2A illustrates the implementation of a standard patch antenna structure utilizing conductor-filled plastic material. The perimeter and plate spacing (K) in 2 and B in 2A are key factors in determining the optimum operating frequencies. Although not shown, these two antennas could have an active element, an amplifier whose input would be the antenna contact and output connection would be the center lead of the coax.

Figures 3 and 4 illustrate a passive and active monopole antenna utilizing conductive plastic materials. As noted, in figure 4, an amplifier is inserted between the antenna and the center lead of the coax to significantly amplify the received signal.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS:

The family of conductor-filled plastics from LNP Engineering or possibly from other firms is a group of thermoplastic compounds containing electrically conductive fillers such as carbon powder, carbon fiber, stainless steel filler, conductive polymers and metal-coated graphite.

The antenna shaped from the conductive plastic material is attached to the active center lead of a coax using a screw or clip out of copper or other conductive-metal to assure mechanical and electrical connectivity to the plastic. An industry standard connector may also be used at the end of the coax. The coax ground may be attached to a ground near the active antenna or in the case of an antenna that is free-standing such as a dipole, the ground side may be connected to an equivalent matched piece of metalized plastic.

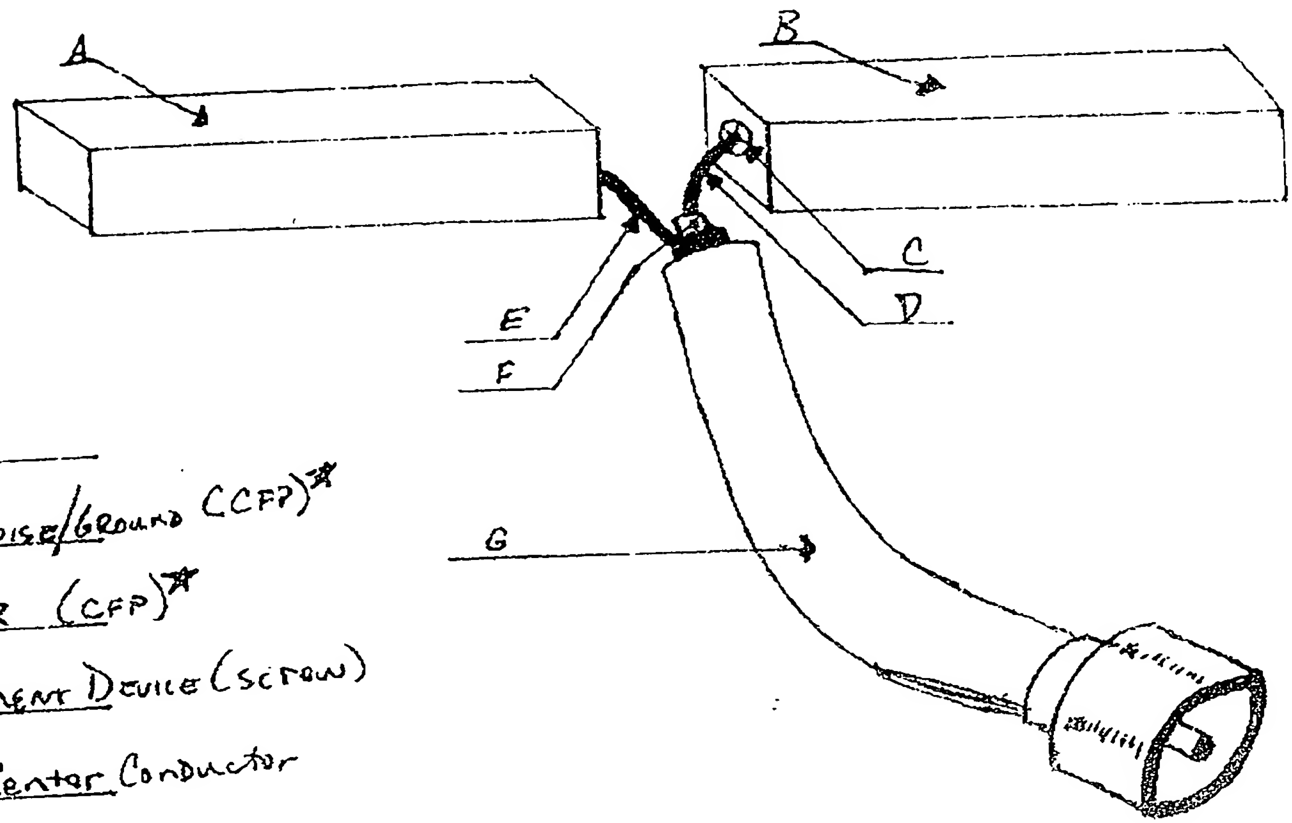
In one example, fig 1, the antenna is shaped like a rectangular rod of total length of 1.5 in with a cross-section that is a square of .3 in sides. The active coax lead is attached at one end and a ground connection at other end. The resultant antenna performs as well as existing dipole products and is noticeably less susceptible to ground plane interference from nearby metal ground surfaces. In this case, the center frequency was 900 MHz. This demonstrates another quality of this antenna; that the quarter wave tuning length is roughly 50% of a standard antenna using wire elements.

In another example, the antenna is shaped like a thin rectangle and placed on a metal surface (a thin insulating spacer between antenna and metal surface). The active lead attached to antenna and the coax ground attached to the metal ground. A rectangle of approximately 4 x 1/2 x 1/16 inches realized an outstanding antenna for 900 MHz. A circular antenna of approximately 4 inches circumference in the same configuration as above realizes an outstanding antenna for 1.57542 GHz (GPS) applications.

Considering the concept of figure 2A, in one example, the segment A is 1.4 in x 1.4 in with a total height of .41 inches. This resultant antenna performed exceptionally well at GPS (Global Positional System) frequencies (about 1.5 GHz.)

In one implementation of figure 4, the height of A was 1.17 inches, with total height from bottom of C to the top of A to be 1.3 inches. This particular design performed very well at GPS frequencies as well.

FIG 1




A COUNTERPOISE/GROUND (CFP)*

B RADIATOR (CFP)*

C ATTACHMENT DEVICE (SCREW)

D COAX- CENTER CONDUCTOR

E COAX- OUTER SHIELD

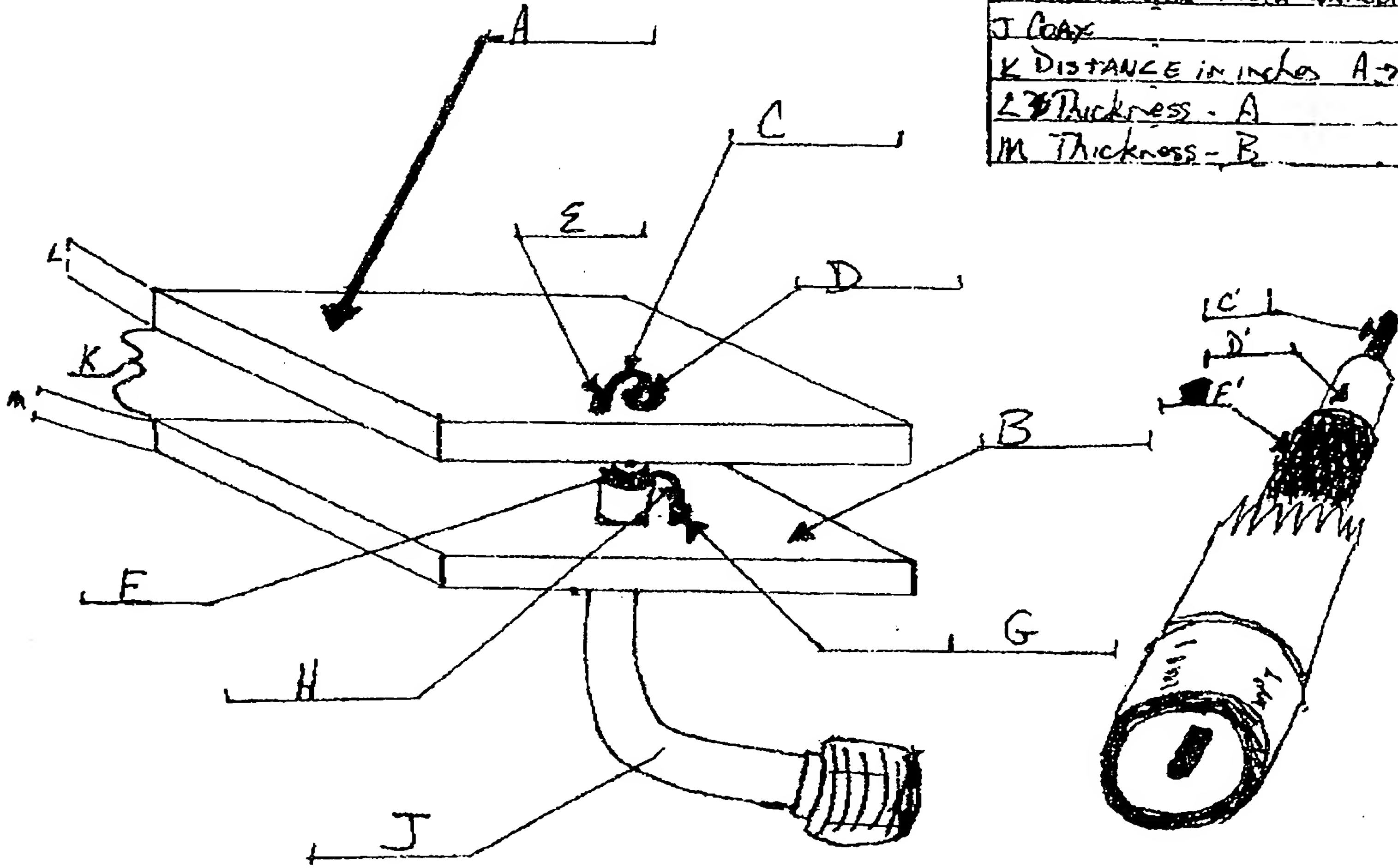
F COAX- CENTER CONDUCTOR INSULATOR

G COAX

* CONDUCTOR-FILLED PLASTIC

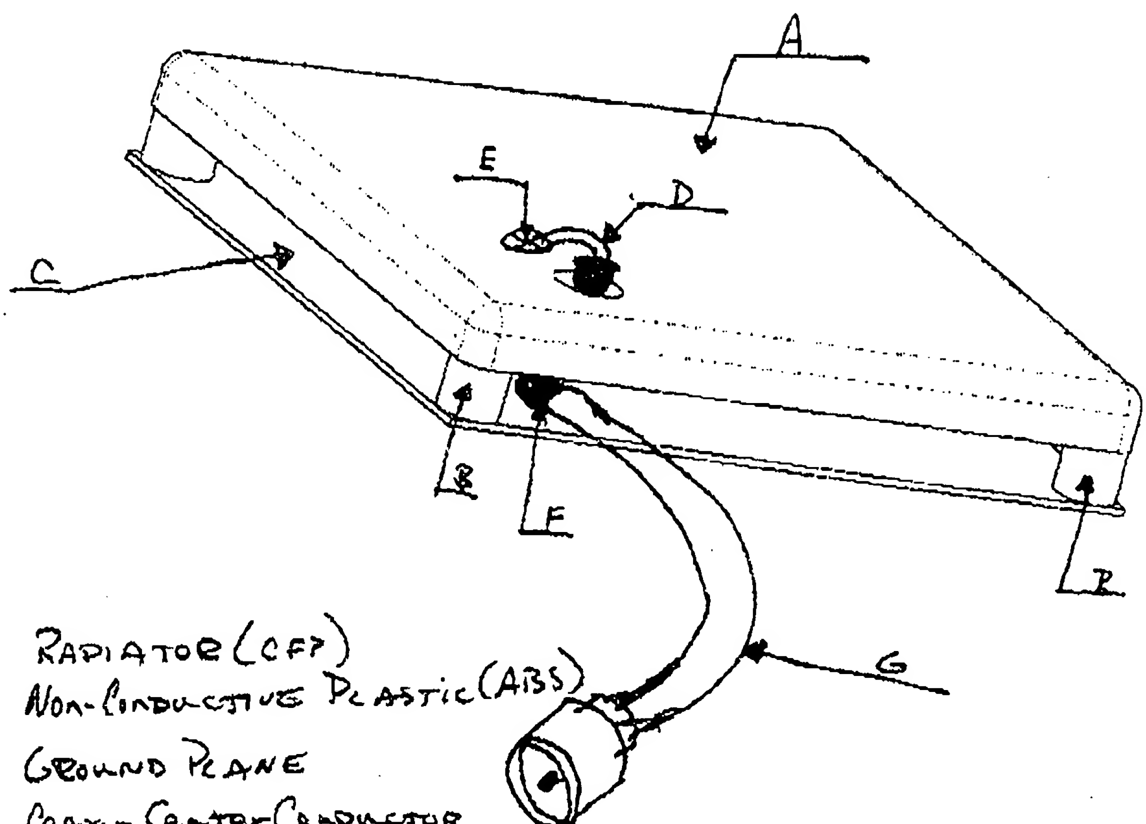
Fig 2
PLASTIC PATCH (CFP)

| | |
|---|---|
| A | RADIATOR - (CFP) |
| B | GROUND PLANE (CFP) |
| C | COAX - CENTER CONDUCTOR |
| D | COAX - CENTER CONDUCTOR INSULATOR |
| E | CONNECTION POINT - RADIATOR |
| F | COAX - OUTER SHIELD |
| G | CONNECTION POINT - GROUND PLANE |
| H | COAX - OUTER Shield Connection |
| J | COAX |
| K | DISTANCE in inches A→B |
| L | Thickness - A |
| M | Thickness - B |




☆ CFP. CONDUCTOR-FILLED PLASTIC

FIG 2 A.
PLASTIC PATCH w/ SIDE FEED (CFP)

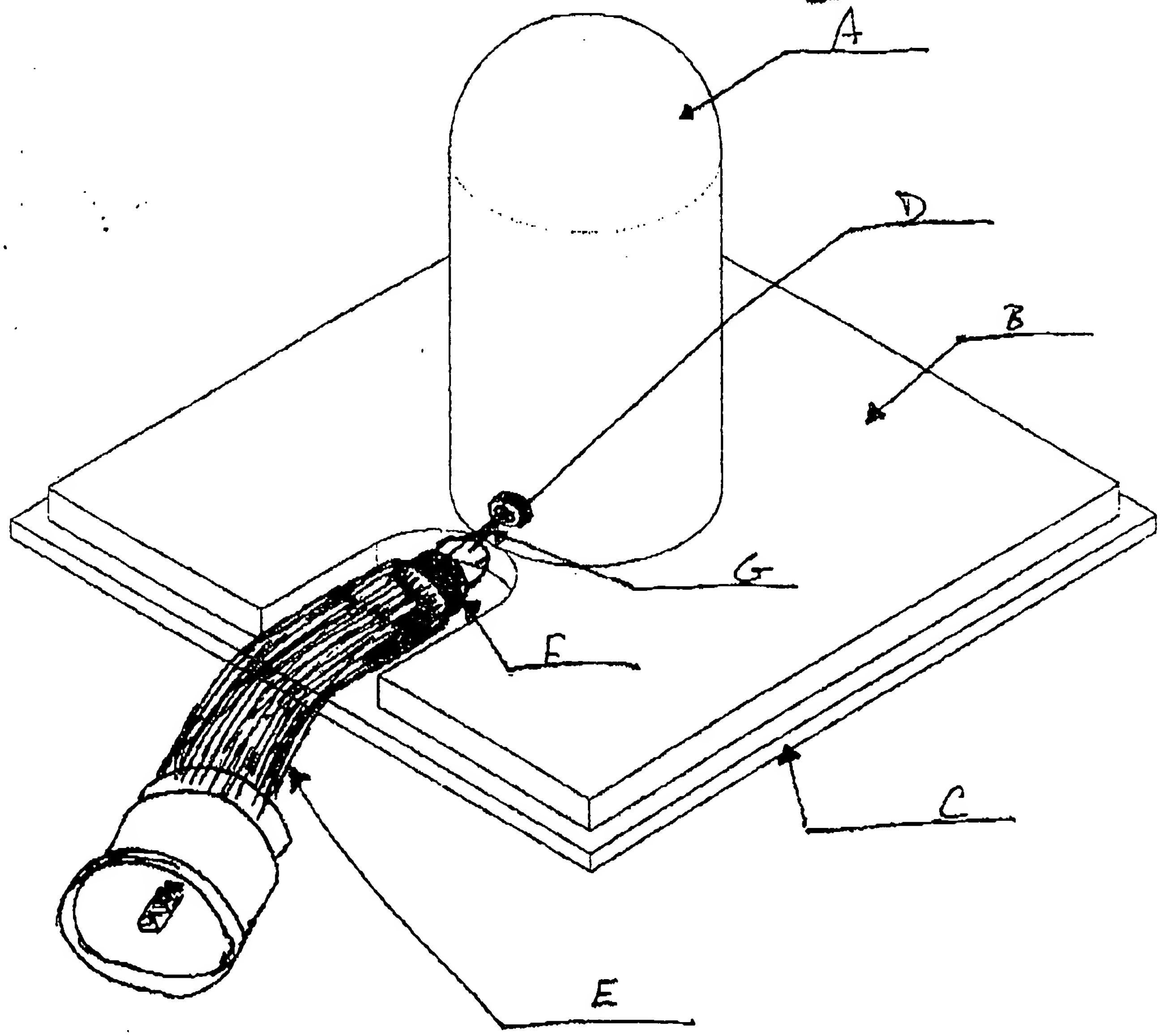



A. RADIATOR (CFP)
B NON-CONDUCTIVE PLASTIC (ABS)
C GROUND PLANE
D. COAX - CENTER CONDUCTOR
E. METAL (COPPER) INSERT
F. COAX - OUTER BRAID
G COAX

* CFP = CARBON-FILLED PLASTIC

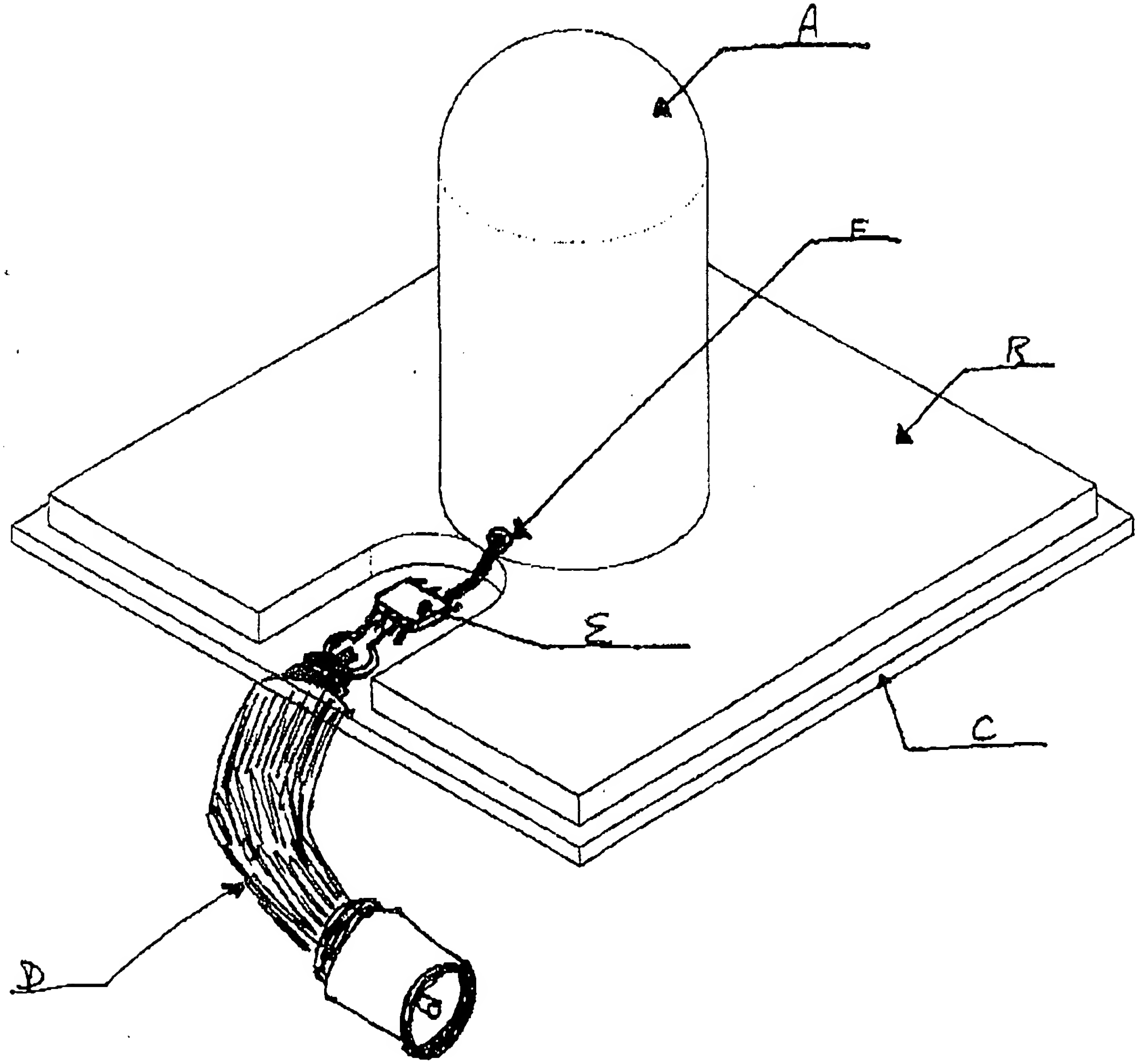
FIGURE 3.
MONOPOLE (CCFP)

A - CFP MONOPOLES
B - INSULATOR
C - GROUND PLANE (FR
or CFP
D - INSERT TO CFP
METAL SCREW OR
SIMILAR
E. COAX
F. COAX - GROUND SHIE




* CFP - CONDUCTOR FILLED PLASTIC

FIGURE 4
Amplified Monopole (CFP)



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These plastic antennas can readily be cut or milled to shape or stamped out of molds, resulting in a more efficient and less costly antenna than can now be produced out of simple wire or from etching metal patterns on circuit boards. In addition, the shaped conductive plastic antenna can be designed to be an integral part of the frame of a display device, i.e., PDA, or the casing of a cell or portable phone.

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In one implementation of figure 4, the height of A was 1.17 inches, with total height from bottom of C to the top of A to be 1.3 inches. This particular design performed very well at GPS frequencies as well.

In net, the antenna implemented using conductive fibers performs better than any known metal antenna or etched printed circuit board antenna near or far from a grounded surface. Since the material is plastic, it can be cut or molded in a form to any shape, flat or curved. Attachment to a center conductor of a coax can be could be with conductive adhesive, plastic heating/reflow, mechanical using screws or other mechanical clips, etc.

Performance of the conductor-filled plastic antennas is affected by proximity to a ground plane to a much lesser degree than standard antennas.

The antenna can be embedded into the plastic housing of the portable electronic units such as PDA's, mobile phones and portable PC's for example, providing equivalent performance to existing solutions, immune to damage as existing exposed monopole antennas, inexpensive to implement.

The cost of the antenna is miniscule in comparison to standard antenna costs due to the low cost of the material and process to form the antenna.